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ABSTRACT

Three functions of educational change and innovation are to hypothesize a solution in a school problem solving process, to meet educational goals more efficiently, and to stimulate interest and progressive development in school personnel. The retrospective study of a five-year implementation of a reading improvement program concluded that this program change accomplished all three functions. The school district coupled a new basal reader program and a criterion referenced testing system with computer assisted instructional methods in an attempt to increase student reading achievement. When teachers were asked to report on their perceptions of the program implementation period, they showed that they adapted in different ways. Program implementation was accomplished through structuring skills (correlation guidelines), time (schedules), and routines (classroom and computer procedures). Some teachers developed new organizational arrangements and approaches; but other teachers continued to use old techniques while adding on the new components, creating the sensation that they were teaching two separate reading systems. Teachers found support in exchanging ideas and complaints with other teachers. Overall, many teachers felt that they had developed a new awareness of the components of reading instruction. (Appendixes provide questionnaires and the interview format used in the study.) (RL)

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TEACHERS ADAPT TO INNOVATION

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I. CONSPECTUS

This research study views in retrospect a five-year implementation of a small school district's reading program. Investigating the nature of educational change in schools, the study is based on the perceptions of classroom teachers probed by means of a questionnaire and interviews, the personal observation and participation of the investigator, and the analysis of other interviews and documents. Quotations from teachers and administrators are used throughout the study to provide documentation, realism, and interest.

A detailed history of the reading improvement program delineates its progress from the needs assessment and presentation to the Board of Education in 1972 to the adoption of published materials. Then, the formation of an implementation committee, inservice and extension education, and pilot studies which preceded the April 1973 Board approval to begin implementation of computer assistance are examined. The historical presentation is concluded with the hiring of additional support personnel who facilitate correlations, supporting materials, and computer program changes.

Three sets of major findings appeared:

1. An investigation of the ways teachers solved problems in a five-year implementation of a reading program

The school district saw the reading achievement scores of its students diminishing. The adoption of a new basal reader and a new testing system assisted by a computer were intended to increase reading achievement more efficiently. Teachers in the study give reading first priority in the elementary curriculum.

The interaction of priorities, time, and energy within the framework of complex changing curriculum components is the background for teachers' perceptions of problems and solutions. Some solutions came as teachers found them in "experience" and in organization and management techniques, especially charting. Some solutions never came.

The idea that educational innovations vary in their complexity is based on studies appearing in the literature of organizational development. This innovation is judged by most of the teachers as more complex than other curricular changes which took place during the implementation of the reading program. The feeling that they could not rely on a backlog of experience --

"didn't know what was expected", "more alien to my experience" -- probably increased teachers' perceptions of complexity.

The overall complexity of the innovation was alleviated by structuring skills (correlation guidelines), time (schedules), students (charts), and routines (classroom and computer procedures). Teachers met the challenges and adapted in many different ways.

2. A study of the change process over time as a factor in the teachers' problem solving

The hypothesis that the types of problems varied with the lapse of the implementation period and that there were solution techniques which seemed applicable at various stages is examined by several approaches. The beginning-year problems and solutions listed by teachers on the questionnaire are compared by a two-group method. The problems of teachers who had started the implementation of the computer assisted testing system in the fall of 1973 (the Original group) were mainly in the areas of time and the correlation of the basal reader with the testing system. Teachers who started the implementation of the computer assisted testing system between 1974 and 1977 (the Midway group) named other problems, but not with the same intensity.

A point of synthesis is examined. Several teachers in the sixteen-sample interview group stated that it took four years for things to fall into place for them. Other teachers varied in their responses from weeks to two or three years.

Current problems are then examined by means of a checklist. The modal responses for the Original group are a feeling of teaching two separate reading systems and a problem of too much time spent in record keeping. For the Midway group, retesting problems involving time and grouping activities as well as time to reteach skills are the most frequent responses.

The long span of the implementation study is a focus of several ideas concerning time. The concept of "gradualism", whereby innovations can be broken down into sub-parts which build upon each other over a period of time to achieve a broad pattern of educational change, is examined. This study points to "gradualism" at various organizational levels and in positive and negative aspects.

Another idea derived from the literature is that the length of the research period affects the implementation period and its results; furthermore, some effects appear after several years have elapsed. Teachers saw the possibility that some problems had increased or changed in some way due to teachers' increasing aware-

ness, the need for variety, the build up of a backlog, or constant addition of curriculum components without deletion.

3. An analysis of the teachers' group interactions as part of a socio-technical system in a school organization

Teachers found support in exchanging ideas and complaints. The standardization of some procedures and the reduction in unanticipated outcomes which resulted probably diminished the complexity of the innovation. The need for effective communication, formally and informally, at all levels of this school organization was met by committees, documents, questionnaires, inservice meetings, professional organizations, administrators' meetings, district reading personnel, and computer printouts in addition to the regular channels of communication in the school organization.

Teachers incorporated computer assistance into their routines with ambivalent feelings: frustration about some procedures, mistakes, possible evaluation, and expense along with more positive feelings about the help in grading and grouping the computer gave. Opinions about the necessity of computer assistance varied widely. Its ability to provide quick and widely-disseminated feedback was acknowledged as a communication device which went to all organizational levels and to the community.

In brief, the importance of the teacher as a professional decision maker in creating solutions to problems, the significance of collegial support from the teacher in the next room and down the hall, and the consequence of the time span as some teachers struggled for several years adapting to this innovation highlight the need for long term studies of the process of educational change.

II. INTRODUCTION

Purpose of the study

In 1973, a small midwestern school district began the implementation of innovative procedures in the reading program of its five elementary schools. Components of the innovative program were:

1. A skills approach to reading instruction;
2. A criterion-referenced testing system;
3. A technological system using a computer to store data on skills acquisition, to report test results, to group students for skill instruction, and to report other summary data.

Prior to 1973, the elementary schools differed in the basal readers which they used in their reading instruction. Improved finance laws facilitated the uniform adoption of one basal reading series in 1972 and the adoption of a testing system assisted by a computer the following year.

In 1979, it is possible to look back over the five-year implementation period and to study the problems and adjustments made in the original plan. The general purpose of this study is to investigate the nature of educational change in schools by means of a long-term retrospective view.

Objectives

The main objectives of this research, which were stated in the proposal, are:

A. To investigate the ways teachers solved problems in a five-year implementation of a reading program;
B. To study the change process over time as a factor in the teachers' problem solving;
C. To analyze the teachers' group interactions as part of a socio-technical system in a school organization.

The data presentation and analysis of this research will be organized into these three areas.

This study will investigate the ways in which teachers met the problems which arose in the implementation of changes in the district's reading program. The three components of the change program: the instructional approach, criterion-referenced testing, and use of a computer are each potential problem study areas.

Time as a factor in problem-solving in an educational organizational change will be analyzed. The analysis will examine the possibility that the types of problems varied with the lapse of the implementation period and that there were solution techniques which seemed applicable at various stages.

The dynamics of the teachers' interactions both within one group and between groups in informal and formal organizational patterns will be an important focus of the study.

Research questions

The research project proposal also stated that in order to achieve these research objectives, some specific questions will be addressed:

1. From a teacher's point of view, what was actually involved in the adoption of each of the three component areas?
2. What was the reference frame (a set of ideas serving to orient- the innovation)?
3. As the implementation of the planned change progressed, what problems were encountered?
4. How were these problems met?
5. Is there any pattern apparent or can a developmental paradigm (stages) be conceptualized from the problems encountered over five years?
6. Can the many data drawn from the five-year history of the program be reanalyzed to provide additional insights about the program?
7. What social dynamics operated within and between teachers' groups -- vertically, horizontally, formally, informally -- as they attempted to adjust to the changes?
8. What feedback procedures arose?
9. What does a reexamination of the original components within the context of the present program show?
10. Can there be a transfer of the knowledge, skills, and structures gained in this change to a move toward competency-based, individualized instruction in the school district?

This research study will also attempt to examine the complexity of the innovation in comparison to other curricula changes from a teacher's point of view. The way in which organizational innovations vary in their complexity and the influence of this variation upon implementation is an important sector of the theory base of this research project.

III. THEORETICAL FRAMEWORK

Variation in the complexity of organizational innovations and the influence of this variation upon implementation have received little consideration in the literature. (Gross, Giacquinta, Bernstein, 1971) These authors noted that organizational innovations vary in their complexity when they studied a four-month implementation period which involved a complete change in one public school's teachers' roles. (Gross et al., page 205) Failure to take complexity into consideration and to establish feedback mechanisms can produce problems in the implementation process.

In complex changes, innovations could be broken down into sub-parts which build upon each other over a period of time to achieve a broad pattern of organizational change. "Gradualism" takes time. (Smith and Keith, 1971, page 373) In a discussion of change as an incremental process as opposed to a "conversion" experience, Bowers uses the simile of "bricks being stacked in a pile". He defines "constructive change" as "an adaptive process consisting of successive increments of movement occurring over a relatively long period of time". (Bowers, 1976, page 132)

Not only are time limits often imposed upon implementations but, also, upon the research surrounding them. (Smith and Keith, 1971, page vi) Too often researchers are in a hurry to evaluate the effects of an innovation before the innovation has been implemented. (Gross et al., 1971) Researchers in a hurry may also study just attitudinal changes or the congruence of teachers' behaviors with the original innovation model. A study of the strategies which teachers may develop to handle changes within the school may not be feasible.

In a four-year study of interventions directed at social interaction and control in a private boarding school, Alderfer and Brown stated that "the long-term relationship, coupled with research, provided unique learning opportunities about planned change." (Alderfer and Brown, 1975, page 52) These researchers were able to revise their efforts when objectives were not met, to discover patterns in the life of the organization, and to overcome initial resistance in some organization members. This seems to suggest that not only the time span of the implementation efforts but the length of the researchers' association with the organization members affected the implementation results.

Alderfer and Brown describe four other studies of organizational change which ranged from one to three years

in length: Elliott Jaques' Changing Culture of a Factory (1952); William F. Whyte and Edith Lentz Hamilton's Action Research for Management (1964); Alfred J. Marrow, David G. Bowers, and Stanley E. Seashore's Management by Participation (1967); and Paul Hill's Towards a New Philosophy of Management (1971). One common thread among these studies which "suggest areas for attention in organizational development activities elsewhere" (page 20) is the time element. They stress that organizational change is not a hasty process and some effects appear after three years have elapsed.(Seashore and Bowers, 1970)

In a study of organizational change, then, the complexity of the change, the incremental rate, the time element, and the communication process may affect the implementation. A study of communication in a school organization points to the interaction of teachers with other teachers and staff. Teachers comprise a social system which interacts informally and formally within its own group and with other groups in the school organization. Moreover, the concept of an organization as a socio-technical system in which changes in one component of the system affect the other has been used to explain the complex characteristics of organizations. Trist et al., 1963) The interaction of teachers with a computer, as they used it as a tool for data and classroom management, conceptualized as a socio-technical system in a school organization is another important sector of the theory base of this research project. (Elizur 1970)

IV. PROCEDURES

In order to meet the research objectives, this one-year research project was divided into these major parts:

A. Personal observation and limited participation in the reading program by the investigator since March 1974 as a remedial reading teacher at four of the elementary schools;
B. Study of program documents, data, and reports;
C. Distribution of a short questionnaire to all of the elementary teachers in the school district;
D. Participation of school district personnel in interviews
   1. Personal, structured, taped interviews with a stratified sampling of elementary teachers
   2. Structured and unstructured discussions with other key personnel involved in planning and implementing the reading improvement program.

Personal observation and participation

Limited participation for some of the early years of the innovation and limited observation during some of the later years made it necessary for me as sole investigator in this project to strive to be an objective observer albeit "stranger and friend". (Everhart, 1977) Title I remedial reading teachers may fit that description. The fact that Title I teachers may be moved to different schools in the district every two years or so tends to keep them on the fringe of becoming too much "friend" as they work with students and teachers in a remedial instruction program.

I was a Title I reading teacher in the school district from March 1974 until May 1978, at first full-time, then dividing my contract year between two elementary schools and an alternative adult high school. In 1976-77, I again taught in the school in which I taught in 1974. Several members of the faculty expressed an interest in cooperating with me in some research. During the 1978-79 school year, while I was conducting this research study, I taught full-time at the alternative adult high school in the district.

Study of program documents, data, and reports

During the summer of 1978, I interviewed several school administrators to obtain a broad background of information about the reading improvement program. These administrators donated documents such as the July 1972 "Proposal to the Board of Education", the "Reading Curriculum Study", and the reading program "Objectives and Implementation". Other reports and

minutes of the Board of Education meetings which dealt with the reading improvement program were obtained during a summer day I spent working in the school district's main office.

Distribution of a short questionnaire to teachers

Then, in September 1978, one primary teacher and two intermediate teachers from different buildings critiqued and revised a preliminary questionnaire which I had sent to them. These teachers contributed several items and suggested changes which were incorporated in various ways into the questionnaire. Near the end of the first quarter of the school year, I was invited to attend a meeting of the school district's administrators. At this October 25th meeting, I gave a brief history of the research project and distributed sample copies of the proposal and the revised questionnaire. We discussed some of the questionnaire items, their source, and the possible methods of distribution to the elementary teachers. Several principals said that they had just had faculty meetings and that they would prefer to pass out the questionnaires and return them to me at my school. One principal said that they often had little questionnaires at their school.

Substitutes, scheduling, and procedures for choosing teachers for the interviews were discussed, also. I stressed that I wanted all schools represented but that I did not intend to compare schools. The next day, I sent through inter-school mail to each elementary principal the exact number of questionnaires for the classroom (kindergarten through sixth grade) teachers in each building.

Most of the questionnaires were completed in brief meetings at the schools. Some questionnaires were distributed by the principal or counselor to the teachers to be returned by a designated day. By November 10, 1978, eighty-nine completed questionnaires had been returned to me by the principals. Only three questionnaires were not returned. Notes were sent to each principal thanking him/her for his/her efforts.

The three teachers who had helped to revise and critique the ten questions on the four-page questionnaire (see Appendix) had estimated their answering times to be between ten and thirty minutes. One teacher, responding to the revised questionnaire, attached a sample chart. About one-fifth of the respondents wrote additional comments. The teachers were asked to remain anonymous.

Questionnaire results were tallied for the whole group, as well as for the year in which the teachers had started the testing system, for example:

1. The "Original" group defined as thirty-six teachers in grades one through six who indicated that they started the computerized testing system in 1973.
2. The "Midway" group defined as thirty-seven teachers in grades one through six who indicated that they started the computerized testing system between February 1974 and December 1977.

CHARACTERISTICS OF TWO TEACHER GROUPS

GROUP	N	YEARS OF TEACHING	MEDIAN
Original	36	5 - 38	14 years
Midway	37	1 1/3 - 18	5 years

Figure 1

Both the Original group and the Midway group had about five to eight teachers representing each grade level. Teacher responses were also tallied according to grade levels.

Kindergarten teachers and "New" teachers were studied separately.

The interviews

Unstructured discussions were held at various times throughout the project period with four administrators usually in person in their offices. One interview was held over the telephone. Another Title I reading teacher also contributed ideas in a short interview.

Analysis of the questionnaire responses suggested areas for further study which were then incorporated into the 29-item structured interview. (See Appendix) Other interview questions were designed to give a picture of the teachers' backgrounds and experience, their initiation into the computerized testing system, their approach to reading instruction, and their perceptions of the implementation period.

Seventeen teachers were chosen in a stratified sampling of the teachers in grades one through six

who had taught in the school district during different stages of the implementation period and who were still teaching in the district. Grade level, school, and the year of starting the testing system were the bases of the stratification. An inherent flaw in this procedure was that at one school only one teacher remained who had started the computerized testing system in 1973. However, chance drawing of the names within the different strata seemed to result in a sample which approximately represented the different numbers of teachers at the various schools.

Interview questions showed that in the sample group of sixteen teachers two teachers had changed grade levels and one teacher had changed school districts in the past six years.

When the teachers in the sample were asked where they had taught, they said Kansas, the Midwest, Missouri, Iowa, Illinois, West Virginia, Florida, Idaho, Minnesota, the East Coast, and the southeastern part of the United States.

When the teachers in the sample were asked what reading courses they had taken, most of them indicated that they had taken at least six hours. Both groups were alike in the number of hours and courses they had taken. The teachers felt that these courses had not prepared them to use the testing system in the current reading program. Moreover, none of them had had any experience with computers.

No attempt was made to schedule the interviews during the snowbound winter months. Sixteen interviews were conducted on Monday, Tuesday, and Wednesday, March 19, 20, and 21, 1979, and on Monday and Tuesday of the following week, near the end of the third quarter of the school year. After the schedule had been arranged, the school principals obtained substitutes for the teachers during the one-hour interview period. Only one of the designated alternates was absent during the interview period. None of the teachers refused to be interviewed or declined to answer any of the questions although they had been given those options. All of the interviews were taped.

Data and excerpts from interviews will be used in conjunction with information derived from personal observation, documents, and the questionnaire to address the research objectives. The procedures used in this project may be summarized as follows.

Against a background of the investigator's limited observation and limited participation, the opinions and experiences of other elementary teachers were sought. The project questionnaire (97% return) gave the views

of the elementary teachers on beginning-year problems and solutions as well as current problems, feedback, and peer interaction. Questionnaire data was analyzed in a two-group method, noting grade levels. Kindergarten teachers and "New" teachers were studied separately. This information was the basis of the structured interview questions which were taped in a series of one-hour interviews with a stratified sample of sixteen teachers. Key administrators and a reading teacher were also interviewed informally. Excerpts from these structured and unstructured interviews are used throughout this research report to clarify and to document the research findings. Moreover, original program documents, School Board minutes, and a 1973 teacher questionnaire provide a realistic base for this long-term retrospective study of educational change in a school district.

V. RESULTS OF THE STUDY

A case history of the reading improvement program

Formal adoption.-

At a recent inservice meeting about curriculum development in the district, an administrator described the district schools in 1969 as similar in socio-economic patterns but totally different in textbook adoptions. Improved finance laws and declining enrollment coupled with a reduction in the teaching staff provided the money for a curriculum improvement program in 1972. The needs assessment presented to the school board consisted of teachers' surveys and questionnaires submitted to students and parents as well as scores on standardized achievement tests.

School Board minutes from May 16, 1972 show that a motion was made by two Board members "that the Board identify the areas of Reading and Math improvement as the district-wide goal for the Curriculum Improvement Project for the 1972-73 school year. (P.P.B.S.)"

A committee of administrators met with reading consultants, then drew up a plan for the objectives and implementation of the reading program. To solve the problem of "below average student achievement in reading - district wide", a proposal was made to the Board on July 11, 1972 which stated these program objectives:

1. A program to enable each kindergarten student to identify each letter and sound of the alphabet;
2. A program in which each first and second grade teacher will diagnose and identify three to five students needing help in reading difficulties;
3. A program in which the (K-12) average achievement in reading, as measured by the (standardized test) will show a gain of five months with six months of instruction.

Six alternatives were outlined in detail in the reading proposal. The School Board chose alternative number one which provided for the purchase of basal readers and supportive materials for all the elementary schools, a kindergarten reading readiness program, diagnostic material, and a teacher training program which included a tuition-paid two-hour extension course in reading for all teachers, Saturday workshops, travel and school visits, as well as consultants.

The committee of administrators sought the advice of university consultants in deciding upon the published materials which would meet the program objectives. In choosing the "diagnostic material", an administrator said in an interview, the district described what they were after: "to measure accomplishment of reading skills in standard uniform measurement (more specific than magazine tests) and then take action on it". A consultant suggested a specific testing system as well as provisions for prescription of teaching materials. The prescription component was vetoed because administrators wanted to allow teachers to exercise their own creativity and expertise.

Implementation processes.-

An implementation committee composed of principals and teachers representing each school was formed. In a letter, dated August 1972, the progress of the reading curriculum study was explained and the purpose of the new reading committee was set forth. "This committee will be responsible to promote the program, gather data in their respective school, and report this information to the reading committee and the central office. The full cooperation of all teachers and administrators is needed in order for this reading program to be successful.." the letter stated in closing.

At this same time, an inservice workshop was held at a local university. A demonstration in reading, using twelve youngsters from a district school, was given. Publishers representatives explained the new basal and the new testing system. New ideas in reading instruction were presented by one of the university's reading professors.

Two-hour semester extension courses in reading or mathematics instruction were held in the district during the 1972-73 year for the elementary staff. Administrators, kindergarten, first, and second grade teachers, as well as special reading teachers, were scheduled to attend the reading class the first semester. A notice to them included the information that "pre-enrollment has been very good (39 so far) and several schools have 100% participation. Administrators are welcome to enroll and several have already done so."

Kindergarten teachers were also scheduled to attend a training session August 24, 1972 in another city. This workshop was to provide special training in the use of the materials for the kindergarten segment of the program objectives.

Another objective which had been included in the proposal to the School Board the previous summer had been that the "(K-12) average achievement in reading, as measured by the (standardized test) will show a gain of five months with six months of instruction." A reading project during the period from October 15, 1972 to April 15, 1973 in one elementary school indicated the "average growth for grades 3, 4, 5, and 6: 6.55 months."

Computer assistance.-

Pilot studies of the diagnostic testing program at the same school in first and second grade, in conjunction with visits to another district using the testing program, showed that hand-scoring and record keeping would be overwhelming additions to the teachers' work load. A computer was suggested as an obvious solution to the problem since the information being analyzed was easily converted to numerical data.

In April 1973, School Board approval to begin implementation of a computer-assisted reading program was given. An administrator-teacher committee was formed: (1) to plan development of the program; (2) to solve physical requirements; (3) to plan training and implementation of the testing system; (4) to distribute materials; and (5) to check each room in the district for operation, according to the administration's planned sequence of events. The starting date was set for June 20, 1973.

A teacher member described some of the work of the committee, in an interview:

> ...My job was to record tapes. Another teacher at this school was on the committee and her job was to go around to the buildings with the principal and see if there were outlets in each room that could be used to plug in the tape recorders adequately. Somebody went to research how much tape recorders would cost and somebody else to look into how much to buy these cabinets and to order the tables. Everybody on the committee got a job to do...

The committee also learned about computers, the teacher explained:

> ...We were taken to the community college and shown how a terminal works and we were taken to the courthouse to see the computer. We met with this - I forget his last name - who was a computer programmer...

The 1973 fall inservice meetings included information about the new computerization system. When school started, the computer assisted testing system was adopted in grades one through six in all of the elementary schools. When the current teachers were asked on the project questionnaire:

(3) Our computer managed Reading System was introduced to most district teachers in the fall of 1973. When did you start using the system? ____Month____Year

fifteen teachers responded "fall 1973" or simply "1973". One of these teachers wrote, "Tried using in '73. Only teacher trying at that grade level. Lacked help I needed. Actually used in '76." One teacher left it blank. Twenty-one teachers specified the month in which they started using the testing system between August and December 1973. These thirty-six teachers who indicated that they started the computerized testing system in 1973 are designated the "Original" group in the analysis of the questionnaire results.

Forty-six teachers who are currently teaching grades one through six in the district were also teaching in the district in 1973. However, two of the current group were then teaching junior high or kindergarten.

A "Reading Program Progress Questionnaire", dated October 2, 1973, was submitted by a district administrator to the elementary teachers. It corroborated the fact that some of the teachers had not used the testing system by that time. Sixty-four teachers from a possible nine-two responded indicating that 21% of the respondents had time problems in general and a lack of time to reteach. Other problem areas listed such as retesting, entry level, materials, and equipment-supply problems became a base for some of the questions on the current questionnaire. (See Appendix)

New personnel -

In the spring of 1974, one of the Title I reading teachers was designated as the coordinator of the reading improvement program. Materials and resource guides for skill instruction were developed by a committee of teachers working with the coordinator during the summer of 1974. These committee members, in turn, became the presenters at the afternoon fall inservice workshop session held at their respective elementary schools. The inservice theme for the August 20, 1974 workshop was entitled "We're All In This Together."

A computer printout entitled "Summary of Reading Program Testing", dated December 11, 1974, listed eighty teachers in grades one through six plus junior high Unified Studies teachers who were using the system.

The correlation of skills in the basal reading series with the skill sequence in the computerized testing system was presented to the teachers in March 1975. When I interviewed them, several members of the 1972-73 implementation committee commented on this component of the testing program:

> ...I remember talking about how something should be done because some of the skills (of the test) aren't going to match the levels (of the basal). But everybody was so involved in trying to get their particular job done and there wasn't anybody set aside in that area to do that...

Another committee person stated:

> ...The correlation of the test with the basal reader was something we wanted to do, but there was no time in 1973...

The correlation effort, called "Guide Lines for the Effective Utilization of the Computer Managed Teacher Support System in Reading", summarized in a nine-page report the distribution of three hundred sixty-six skills to "more closely approximate the (basal reader) sequence". The plan, developed by the coordinator and the reading specialists, suggested that "tests be given after the student has had skill instruction within the framework of the basal reader and has had sufficient practice of the skills".

Typed scripts of the taped presentation of the tests were also made at this time to provide another option which teachers could use in the testing program.

An administrative memo, dated June 20, 1975, summarized the start of the testing program in the kindergartens. By May 20, all kindergarten students in the district had been tested on initial consonants. A "spot check" of the tests at each building showed a wide variation in testing procedures and results. At one school, 27% of the students tested made zero errors. "A few perfect scores" were made at two other schools where it was noted "either the student made few errors or many errors."

A Director of Data Processing - who also would teach at the high school - was hired in June 1975. At the inception of the computer component of the reading program, a consultant data engineer had been employed to develop the system. A paper submitted at the annual meeting of the IRA Plains Regional Conference in March 1976 and other conferences on reading and curriculum by one of the district's administrators, described the computer managed reading program in detail. In summary, the

paper stated:

> We have gained much insight into the effective implementation and utilization of the entire program as well as the computer programs since our start three years ago; but the plan is still basically the same that we proposed to our Board of Education at the outset of our efforts to improve student reading achievement.

The Director of Data Processing explained recently in a telephone interview that during his first year on the job (1975-76), he had to work on other computer systems used by the school district. The reading computer program, he said, was the most complete and best documented system in the district, so work on it was delayed.

Evolution of the innovative program.-

During the 1975-76 school year, however, new facets of the reading improvement program were instigated following their recommendation in a district document entitled "Task Force II".

A follow-up memo dated December 3, 1975 noted the progress to date in the nine recommendations which had been made in the Task Force II document. It is summarized as follows:

1. The testing program - operational in the junior high school for those students who had not demonstrated mastery of skills through the highest level.
2. Materials for the junior high school incorporated in a Right to Read proposal.
3. Scripts were being prepared by a typist to be put in booklet form.
4. Inservice -- new teachers. A one-half day inservice for teachers was held on August 18 (1975) dealing specifically with (the testing program).
5. Continuation of staff development -- on-going with Title I staff working with teachers in each building. Also, Title I staff members met with the principals on August 14th to discuss the Reading Resource role in this year's project. Title I staff members met with a central office administrator in October to voice their concerns.
6. Purchase of recommended supplementary materials which were to be self-instructional and self-correcting: on-going activity during the year. Materials ordered for one elementary school were received and placed in the classrooms on December 1.

7. Entry level into reading program for all new students: Title I teachers administer a placement test for all new students at the elementary level. In addition, by teacher request, they test other students whom teachers think are placed too high in the reading program.

Some final changes.-

In March 1976, teachers were requested to start sending a second copy of the student's Test Results Report home to parents. Also, that spring, the Board of Education reviewed the existing reading program and again endorsed the total program including the testing component. Computer program changes started to appear.

The Data Processing Director, reported in the telephone interview "the first day I walked in the door" he was asked to make a change so that the teacher-student numbers would be rejected if they did not agree. He further reported that a March 1976 memo from an administrator asked, "Can we get goals up?"

The goal-setting component of the testing program, whereby students, teachers, principals, and the district stated the number of new reading skills hoped to achieve in a given period of time, had been a part of the original plan according to several staff members.

In May 1976, the Data Processing Director made the first major changes which made it possible to correct student records, set goals, and reset goals. A fall inservice meeting, an information sheet, and a detailed instruction sheet from the data clerk outlined for the teachers the steps in effecting changes to students' reading skills computer records.

Along with the goal setting component came a change in summary reporting in the district. From 1973 to the end of the first semester in January 1977, the "Summary of Reading Program Testing" report (sometimes called a utilization report) regularly showed for each teacher the skills tested, skills achieved, skills missed, and per cent achieved. This information, then, was summarized by the coordinator in a chart which showed the "average number of skills achieved per student by grade and school at the end of the first semester of the 1973-77 school years". Only the "District Average" section is shown in Figure 2.

A new summary report called "Reading Skills Progress Report" gave simply the teacher's name, goals set, and skills achieved as well as the number of students in the class. A sample of this report is shown in Figure 3. The June 1978 and May 1979 reports showed 100% utilization of the reading skill program.

DISTRICT AVERAGE

(average number of skills achieved per student)

GRADE	2-4-74	1-31-75	1-26-76	1-26-77
1	20.3	24.2	19.5	17.5
2	52.4	70.0	62.2	57.1
3	58.2	128.5	132.9	119.2
4	25.6	105.9	165.2	169.6
5	17.8	50.6	139.9	194.6
6	10.7	44.0	102.8	182.9

Figure 2

READING SKILLS PROGRESS REPORT (1977-79)

Teacher: No.	Name	Goals: Set	Achieved	No.Stud.
0911	Z. Smith	1017	365	31
0912	P. Thompson	1179	962	29
	Totals	2196	1327	60
0931	L. Lacy	2897	2730	24
0932	S. David	584	753	23
	Totals	3481	3483	47

Figure 3

With the implementation of goal setting, a new form communicated to students at the top of their "Test Results" a message such as the following:

"Goal: 63 New Skills
Attained: 25 as of 12/16/76
Good luck Sally."

Along with "internal" and other computer changes such as the addition of the identification of the test tape to the test results (at a teacher's request), the Director told of a change in operating procedure so that the printouts were delivered to the schools in the evening by the security men. This placed the information in the school offices the first thing in the morning.

A sixth-grade teacher in the interview sample commented on this aspect:

> ...A lot of my kids look forward to getting their printout back to see if they passed their test. Usually we get 24-hour service. If it happens to go 36, some of my kids get upset...

Service to the teachers and input from them (some wrote notes or called, he said) were goals set by the Data Processing Director and were part of a 1977-78 teachers' inservice meeting held during the school year. Attending teachers, who could have chosen other inservice meetings, observed the end-of-the-day scoring of tests and took part in a discussion voicing their ideas and concerns.

Among the most recent computer program changes was one which rebuilt the test records of students who had left the district and had returned. A change which was directed to some problems frequently mentioned by the teachers was made in March 1978. This change resulted in the computer printout not reporting a skill as missed if the skill was missed after being previously reported as mastered.

These computer program changes were the culmination of a series of adjustments involving implementation processes, technological assistance, and personnel support. The reported sequence of events covered a span of six years in which the school district first recognized its students' needs for reading (and mathematics) improvement, proposed objectives for the remediation of these needs, and then gradually implemented the objectives. As teachers worked at this implementation, they perceived problems which seemed to impede their efforts. This detailed history has been presented to facilitate comparisons with the teacher perceptions which follow.

An investigation of the ways teachers solved problems in a five-year implementation of a reading program

Teacher perceptions of beginning-year problems and solutions-

Teachers were asked on the questionnaire:

> Can you list at least three problems which you encountered in the first year you used the (test) system and the computer technology. If there was a solution, what was it?
>
> Please use the letter of any of the problems listed in question number 6 or use your own words. Please list the problems in order of importance to you -- A highest.

Figure 4 categorizes the responses of two groups of teachers concerning their perceptions of their beginning-year problems. Teachers listed from one to four problems. Figure 5 briefly lists the solutions to the various problem areas. The modal solution is starred. In Figure 4, a teacher is only counted one time in a category but may be counted in a number of categories. In Figure 5, all of the different solutions are listed in their respective problem areas.

PROBLEM AREA	ORIGINAL GROUP N=36		MIDWAY GROUP N=37	
	Number of Teachers	% of Group	Number of Teachers	% of Group
Correlation of basal with test	16	44%	9	24%
Time	15	42%	10	27%
Organization and management	13	36%	13	35%
Computer	8	22%	11	30%
Tapes	8	22%	7	19%
Test attributes	5	14%	4	11%
Instructional materials	5	14%	0	-

Figure 4: BEGINNING-YEAR PROBLEMS

SOLUTIONS TO BEGINNING-YEAR PROBLEMS

PROBLEM AREA	ORIGINAL GROUP	MIDWAY GROUP
Correlation of basal with test	Guidelines* Supplemental materials ½ day at teacher center	Guidelines* Specific skills review Experience, help Trial and error
Time	Specific test time* Charting Experience Better organization Change in instruction Evenings at home	Reading time* Working with system
Organization and management	Small classes Reward system Resource box Another teacher's tracking system Student help Experience Better communications Help from district ½ day working	Experience setting goals* Charting Room arrangement Master copies of answers Start testing earlier Asked enough questions Another teacher's system
Computer	Program changes in reporting* ½ day at teacher center	Program changes Practice Procedure for corrections Printouts parents
Tapes	Read test script* New tapes Stop tape, repeat	Same
Test attributes	Give in parts Acceptance	Rephrase question
Instructional materials	Materials and resource guides* Experience	-

Figure 5

Elaboration of problem areas, definitions, solutions, and teachers' comments.-

A. Correlation of basal reader with the test:

Criteria for inclusion of the briefly stated beginning-year problems into this group were:

1. Key words and phrases used by respondents such as "coincide", "match", "go along with", "fit", "correlate", "coordinated", "correspond", "two systems", "choice of level", "when to test".
2. Solutions which referred to the use of the "Guidelines" or a "sequence chart".

The solutions which most of the 1973 (Original) teachers gave for this problem directly or indirectly mentioned the "Guidelines" which appeared in March 1975. For one teacher, supplemental materials and for another teacher, a half day spent at the teacher curriculum center were helpful. The Midway group (1974-77 teachers) also referred indirectly to the correlation effort of the "Guidelines". Teachers who started the system after 1974 mentioned specific skills review before testing and "experience" as their solutions to this problem area.

Many comments which teachers made during the interviews were about the correlation of the basal reader with the test. Some representative remarks were:

> ...We really had some problems with (the test) right at first that I forgot about. The color coding didn't match where the skills were presented in the basal reader. We kept saying, 'Here we're testing children on things like stressed syllable and they haven't hardly begun syllables.' Finally, after a year or year and a half that we dealt with it, then someone, the coordinator, I think, or a committee went through and tried to key the (test) to the basal program...
>
> ...One test is very poor -- doesn't tie in at all...
>
> ...It's been that way all along -- not the problem in that you've adjusted to it -- but it's still there. It doesn't particularly bother me anymore because that's the way things are. You learn to adjust...

B. Time:

Inclusion of the beginning-year problems into this category was based on use of the word 'time' in the statement of the problem.

Scheduling a specific testing time (usually weekly) was the solution given by four of the Original teachers. Charting or a check system was mentioned, too, as well

as experience, better organization, a change in instructional approach, and using "evenings at home to keep up clerical work". For most of the Midway teachers, time problems were either unsolved and listed as a current problem also, or solved tentatively by using reading group time, or to be solved in the future ("Aids are needed to keep records.")

In the interviews, teachers explained further:

> ...It's extra time on the teacher's part - outside school - in order to become familiar with the new series of whatever it is you're working with. We had to do this with our new basals when we got those because you don't have time in school to sit down and go through a book and just see how it's set up and what kind of vocabulary it has. You have to take it home. That's outside time work...
>
> ...but it's so hard to get five preparations that are really meaningful and good; get them checked; get them back; work with the kids; give them the right directions -- go back over the instructions. You go crazy plus some of them you only have for forty minutes...As we've gone through this, I remember this: time, time, time. Even pulling tests out of the file cabinets takes forever and six months. I have twenty minutes every day free and that's it...

C. Organization and management:

This broad category encompasses different levels discernible in the problems or solutions.

1. Classroom procedures such as "a resource box", "charting", room arrangement;
2. Student help, attitudes, class size;
3. "Rules" of the testing system, the "setup";
4. Use and communications within a building;
5. Key words and phrases such as "disorganized", "confusion", "record keeping", "reteaching", "organization", "setting goals".

For teachers in the Original group, the varieties of problems included in this category were solved by classroom techniques such as small classes, a reward system, a resource box, a tracking system, and student help. Other solutions were found in using materials, giving the tests, "just working with it", a "work day" spent stocking test files, "better communications", help from the district office, and one-half day spent with the coordinator. Five teachers in the Midway

group indicated dissatisfaction with their understandings of the problem or had no solution. Charting was mentioned several times as a solution, but then the teacher asked: "Why can't computer do this?" Other classroom techniques such as arranging a place in the room and making up master copies of the answers were given. Learning how to change or set goals was mentioned. ("After I'd goofed - middle of year - I figured it out.") A suggestion made by a 1977 teacher was, "More inservice and hands on classes."

Teachers who were interviewed discussed this:

> ...At first it's almost overwhelming and you think of putting tests in folders, and keeping a record - a running record of it - making sure the children get what they're supposed to get and retest where they were supposed to retest and move on from one level to the next. The first month that I used it I had to ask several questions - while it wasn't anything really serious - it took about a month - maybe six weeks even - before the program began to operate itself and I just needed to monitor it...

> ...I can remember just having it be thrown at me. Here's the book - read it and get started. It was given to me at the beginning of school and said to have it implemented by October...

> ...I think having to get used to different management techniques. There have been some changes as far as administering the test. First, we couldn't get a script...

D. Computer:

Criteria for inclusion of the beginning-year problems into this group were:

1. Use of the word "computer" or "printout";
2. The inclusion of a computer procedure in the problem or solution. An example of a perceived computer program problem: "Have to give whole test over when skill is missed -- still not solved by computer".

Reporting changes made on the printout were the solutions for several teachers in the Original group. One teacher said, "Reteach skills are grouped, but should group together according to tests, also." Computer program changes and "practice over the years" were the main techniques given by the Midway teachers in adapting to the computer. Several teachers gave specific solutions on correcting answers and doing away with carbon copies. Saving the printouts for parent conferences was recommended.

The teachers in the interview sample discussed their interaction with a computer. Typical comments were:

> ...First of all, when the computer started, I wondered how they were keypunched in there because lots of times it seemed like there were lots of mistakes...
>
> ...It was very difficult for me to figure out those tests from a profile -- which tests they were...
>
> ...I finally was able to figure out how to read the sheets and what they meant but that didn't come right away. I think it's basically a lot of my not knowing -- that's why I didn't understand it...
>
> ...I feel better about the computer this year than I have in the past. Well, they're not giving reteaches on things they already know...

E. Tapes:

This category was defined by the use of the word "tapes" in a listening situation. Ordering new tapes, stopping the tape and repeating, or reading the test script were solutions given by both teacher groups.

Recalling the experience he had in using the tapes to administer the tests, one teacher suggested:

> ...The first thing they ought to go through is how to use the tapes and the tape recorders -- the earphone posts and how to work those things. I didn't know how to work them at first...

F. Test attributes:

Criteria included:

1. Teacher perceptions of "ambiguity", validity, length, difficulty, value, vagueness;
2. The mention of the teacher's approach to reading instruction.

Generally, no solution was given for these problems. Several teachers mentioned giving the "too-long" first test in parts as well as re-phrasing "vague" questions. "Realization and acceptance that not all test questions are good test questions" was one teacher's solution to students missing a "skill that I knew students knew."

Teachers, when they were interviewed, said:

> ...Can you imagine what this would be like if you took a third grade skill (in math) and threw it in the first grade test? This is exactly what they are doing in reading. They are putting skills

that have no business in there - they're throwing them down in there...

...It didn't start out in the beginning telling me anything and it's still for a lot of people not telling them anything and I think part of it has to do with the introduction...

G. Instructional materials:

This category was defined by the use of the word "materials" in a context of need. Only 1973 starters mentioned this problem. The materials and resource guides developed in the summer of 1974 were the solutions given by these teachers. One teacher said, "Experience."

Teachers explained in the interviews:

...In the beginning there was a lack. They wanted more practice work. So we did develop a box where we can go to it...

...It seemed to be knowing where the resources were. That was one problem. I ran off pages from texts. Perhaps that was partly my fault -- that I didn't find out where the resources were...

...I find that I used to go to the (supplemental) material and I'm not happy with it...Ours is not empty and I gave it a fair shake my first year. I had to make dittos; I had to run off 1, 2, 3 -- however many people needed it. But I did not like on the whole the materials. Particularly at this grade level, I found that some of the materials were sheets loaded with small print, poorly organized, and inappropriate to my children...

The teachers perceived these problem areas and solutions as beginning-year problems when they were asked on the questionnaire to look back to the first year in which they used the test system and the computer technology. All of the sixteen teachers in the interview sample were represented in these interview excerpts about beginning problem areas. Although a teacher might have included the entire span of the implementation period in the remark, some focus was apparent which established it as the perception of a beginning-year problem.

<u>A study of the change process over time as a factor in the teachers' problem solving</u>

Getting it all together.-

In an attempt to explore the time period between the

beginning-year problems perceived by the teachers and their current problems, the sixteen teachers in the interview sample were asked:

> Looking back over the implementation period, was there a definite point in time when things fell into place for you and you felt as if you'd gotten it all together as far as using the testing system and the computer?

Responses varied from eight weeks to four years. Two sample teachers from the Original group indicated that the longer period was necessary for them and that "getting it all together" one year may not carry over to the next year.

When the question was read, one teacher responded:

> ...Last year. This year it's a little bit different. I don't know -- more going -- other things that I'm involved with in my classroom - keeping closer tabs on certain things - certain students - I got my mind more occupied. I may be lucky this year to just get my goals - I like to go back and retest...

A 1973 primary teacher outlined her progress year by year:

> ...I don't think I really got it all together until some time last year. (I took four years.) The first year you just felt like it was thrown upon you, 'Here do this.' It seemed so unrealistic. Myself, I just said, "There's no way I can test all these skills and there's no way that any of my children can even attain all these skills." At that time - I made up my mind I wasn't going to worry about that. Then, the second year more discussion went on about it and into the third year (or end of the second) when they finally correlated. Then, what we had been saying all along was proven out and was done. And then, I think, when it actually came down to setting goals and seeing those being reached or not reached was when I felt like I was really seeing a reason for this and was paying more attention to my printouts and what the children were doing and using the materials box a little bit which I hadn't been using...

Another specific point in time was named in response to this question. The March 1978 computer program change which resulted in the printout not showing errors that had been previously mastered was referred to by a primary teacher in the Original group:

...You were literally fighting the machine before that happened. That was the biggest help - to get that fixed so that once they had something it wouldn't keep marking it wrong. It would leave it as being something they knew...

Teachers also estimated two or three years citing the need for an "accumulation of experience", or "a progression of steps". Another primary teacher from the Original group described the process:

...I think just working through it - dealing with the materials and working through it and getting the printouts. I think it's with anything else - you can hear about it, but when you put it to use and you've really worked with it, then you can see how it all goes and you find a way to work with it. I can't say one week or two weeks or anything. I just know that after the first year, you felt like you were more efficient or competent with whatever you were dealing with. Of course, they did add some new things as they went along...

A person, instead of an event or an accumulation of experience, marked this point in time for an upper-grade teacher in the Original group. Referring to a Title I reading teacher who helped in 1975-76, the classroom teacher explained:

...I was really just floundering -- I was doing as much as I could and not doing it right -- to be perfectly honest. I was testing and I was teaching to the test, but it wasn't always the right test for the book and when the reading teacher came in, she sat down and she charted it all for me. 'This is where you are. This is what we're doing.' It was fine...

A Midway teacher, who had started the testing system in the fall of 1974, pinpointed goal setting, also:

...I think probably when things really started falling into place was when we were forced to make goals. Then, I knew exactly what was expected of me and what I was going to expect of the kids. So that was what - two years ago? Just because I thought of exactly how many books they were going to make through that year - instead of just thinking, 'I'm going to just go as far as I can.'...

Not all teachers who were interviewed felt they had reached a point when things fell into place. Another Midway teacher answered:

...I was going to say, 'None of the above!' I'm

frustrated with the testing system because the lines of discrimination in some of those tests are so fine. I think it's frustrating. I think the time element that we spend on it is frustrating...

Other Midway teachers in the interview sample responded:

...Yes - it did happen. It was gradual, but I'd say within eight to ten weeks I understood what was happening and my place in it and the record keeping. I suppose it depends on how many tests you give during that time...

...Yes. I would say last year probably in the middle of the year after I'd given several tests...

...End of first year -- confused. I talked to the principal because the teacher who had left had too many goals...

...Yes, the start of my third year I finally got going. They finally got their act together. I finally got to understand the printout and how to graph my own kids and not worry about what they were saying all the time and handle it my own way and I haven't changed since...

Current problems.-

Two items in the questionnaire focused on problems which the elementary teachers had currently. The data were not quantitatively directly comparable to the data shown in Figures 4 and 5 or to the preceding interview samples. Comparisons were made between the Original and the Midway group at the current level. The questionnaire asked:

> Currently, do you have any problems in using the testing system and/or the computer technology? Please circle your answer. If 'Yes', please turn this page over and answer question number 6.
>
> YES NO

The responses to this question seem to show some indecision on the part of some teachers which may have been caused by the wording of the question. An Original teacher may have expressed the feelings of this third of the group by circling both choices with one big circle, then writing: "I understand it and can work with it." In the final analysis, however, exactly the same number of teachers in each group (26) made some type of positive response, as opposed to a purely negative response. Their responses follow.

RESPONSES TO QUESTION NUMBER 5

	ORIGINAL GROUP	MIDWAY GROUP	TOTAL
Yes	10	17	27
Yes and No	2	1	3
Some	1	0	1
No - then crossed it out and marked yes	5	4	9
Marked both then crossed them out and marked yes	1	0	1
No - but then marked items on (6)	7	4	11
No	10	11	21

When they turned the page, the teachers saw this question:

Currently, I have the following problems in using the (testing) system and/or the computer technology: (Please circle all the letters of your choices. Star the one most important to you.)

	RESPONSES ORIGINAL	MIDWAY
a. It requires too much time to keep the necessary records.	18 (including 7*)	13 (1*)
b. I need more skill instruction materials.	7	5 (1*)
c. I feel as if I am teaching two separate reading systems.	20 (9*)	10
d. I have retesting problems, such as: time (4;6) - other mistakes (5;1) - group activ. (0;4)	12 (1*)	15 (2*)
e. I lack enough time to reteach skills.	10	14 (2*)
f. I have trouble determining the level at which to enter a child into the system.	4 (1*)	4
g. Others - computer errors (2;2) tapes (1;4) teachers testing (1;1)	5	9 (2*)
TOTALS	76 (18*)	70 (8*)

An analysis of teachers' group interactions as part of a socio-technical system in a school organization

Between teachers.-

One item on the questionnaire and several interview questions attempted to determine the amount and type of interaction between teachers as well as the initiation of new teachers into the system and provisions for renewal.

What roles have other teachers played this year and/or in previous years as you tried to adapt to this innovation?
(Please circle all the letters of your choices. Star the one most important to you.)

	RESPONSES	
	ORIGINAL	MIDWAY
A. Other teachers gave me information about the system.	13	24 (2*)
B. I learned techniques from other teachers which made things run more smoothly.	21 (6*)	27 (5*)
C. We aired our complaints to each other.	25 (1*)	21 (1*)
D. We traded groups for testing.	7	7 (1*)
E. We exchanged groups for (test) skills instruction.	4	5 (2*)
F. Others - on my own (2;1) reading teachers (1;1) exchanged groups anyway	3 (1*)	2
Blank	1	
None	2	1

Teachers were also asked on the interview:

How did you first learn the procedures for using the computer assistance?

Their responses included workshops, reading material, and inservice before starting. Some comments were:

...Teachers helped us out - we had inservice and activities to teach us. We took more than one year to smooth it out...

...Trial and error...

...Through committees that worked on it in the summertime...It was presented to us as a group - first year it began. A principal told us about it. I remember him telling everybody not to get shook up...We had meetings here with our principal...

...One session at (a local university)...We had inservice because I remember that they had a panel...Of course, working on the committee we talked about it because we worked through what equipment we would need. So I became familiar with it...

Using a computer.-

The questionnaire did not include any direct questions about the use of a computer. Most remarks about a computer appeared in responses to the question about first year problems and solutions. These responses usually contained elements of personification, for example:

Still not solved by computer.
Computer sending back every choice as wrong answer.
I have trouble with the computer getting my room list correct.
Computer entered test on wrong student.
Computer giving out candy...

Within the interview situation, a similar remark was often accompanied by a grin. During several interviews, I remarked to the teacher that unfortunately I couldn't record the facial expression.

Three questions in the structured interview directly inquired about use of a computer:

What experience did you have with computers?

Was the computer assistance a necessary adjunct to the testing program?

Can you make some statements about your experiences with a computer? What's in the future for computers and schools?

All of the teachers in the interview sample said that they had had no previous experience with computers. Opinions about the necessity of computer assistance were more varied:

...A credible teacher could do it...
...If we didn't have the computer, I wouldn't do it at all...
...Yes...
...I wouldn't say it was necessary but it does help - as far as taking a lot of time from grading and it gives you something also to send home to parents...
...I see it as a verification of my record keeping...
...I think it helps it...This is a district-wide thing and we're all working on this together. I think that probably keeps you thinking about it more than it would if you just had it in your own room...

The future might hold some dangers one teacher felt:

...Maybe with testing and with the computer and with the computer for everything else, we could get carried away and just really overdo - giving kids too much to do...

Other teachers explored their feelings about computer assistance:

...It's fairly accurate, but it's still a machine and it's not going to do any more than what I get it to do. It doesn't teach the kids a thing. It's just a place to store information on each one...

...It would be nice to have a quicky film or a man to come and talk and say, 'This is what I do'...They're not human to me. The only time they're human is when that girl says, 'Keypunch error on my part' and I'm always so glad when it's a key punch error on her part and not me!...

...I have very neutral feelings about it. It's a lot of paper...

Helping "New" teachers.-

A teacher "new" to the testing system was one who had worked as a substitute and special teacher in the district for many years but had just started as a regular classroom teacher in the fall of 1978.

Commenting upon teachers who had been helpful, this "new" teacher said:

...yet I felt it really wasn't their responsibility to sit down and help and teach it all...

Another "new" teacher who had previously substituted in the district and had taught in another state for two years told of working with a buddy teacher to learn about the reading program.

There were ten "New" teachers -- defined as those teachers who started using the testing system in 1978-79 -- with one to thirty-two years of teaching experience. The median was 2.5 years of experience. Four of the ten teachers in this group had not yet started using the testing system at the time they received the questionnaire.

The main problem for five "New" teachers was:

...No inservice training for new teachers...

The range of responses on the questionnaire for those "New" teachers who had started the testing system was similar to the responses of the Midway group.

Training for teachers who were new to the testing program was discussed in the interview.

What kind of training should new teachers have? Can other teachers help?

Most of the teachers interviewed suggested inservice meetings before the school year started "with experienced teachers helping". Other teachers included a follow-up in individual classrooms:

...They could actually go through the process. Teachers could help others before the school day or after. I'd be glad to help some new teachers...

A different viewpoint was expressed by several "plungers", as a Midway teacher explained:

...Personally, I'm a plunger. I like to read the material and try it out. I can see where it would have been valuable for me to observe someone else doing some testing...I would like to see a range of approach. I find that generally inservice takes three hours to do something that I can figure out in twenty minutes...

Feedback.-

Two specific questions were directed toward this aspect of organizational interaction. The questionnaire:

Did you make any suggestions to improve any aspect of the reading program?

YES NO

If you circled YES, please explain your suggestion and include the time and place it was made.

	RESPONSES		
	ORIGINAL GROUP	MIDWAY GROUP	TOTAL
Yes	12	3	15
Yes and no	1	0	1
No	17	25	42
Blank	6	8	14
?	0	1	1

Suggestions listed by the Original group were:

1. Use basically for what each teacher needs for diagnosis, not the complete series until totally cleared.
2. Some words don't apply to everyday life of students. (suggestion made at workshops 1977)
3. Check sheet.
4. Some of the skills are also taught in the English program. While working on the English program, I fed these tests into the evaluation. I use my afternoon English class for skill lessons particularly when they are in the English program. This gives me a little more time.
5. Helped write Language Arts program for (school district).
6. Don't remember suggestions or time and place.
7. Make materials easily available for teaching skills. (suggestion made many times.)
8. ...I think more questions per skill should be asked along with rewording some questions...
9. Had teachers visit classroom to see wall chart. (suggestion made four years ago)
10. Shared ideas on use of graphs for individual skills in order. Use of teacher given, rather than tape given, tests with other teachers.
11. Do those skills for book using. (Enclosed check lists)
12. Asked to have tests matched to the basal readers currently in use.
13. Stop using (the test system) or use it for what it was meant for instead of a method of keeping track of teacher goals.

Suggestions listed by the Midway group were:

1. We need more variety to help the slower learner.
2. We have tests centralized for availability. (suggestion made in our office - spring)
3. Corrections have to be made this way: ~~away~~ okay

Interviewed teachers were asked:

> What feedback procedures took place? Parents? Students? What avenues were available to you for communication about the program?

A representative response was:

> ...Parents still do not know what (the testing system) is...parents still do not understand. I think that it would be a good thing to work through PTAs...
>
> ...Most of the time the printout doesn't get home. They have told me...

Parent conferences often included an explanation of printouts, the teachers said.

Teachers reported that student feedback ranged from:

> ...Sometimes I see a moan or a groan or a pained expression, 'I know I have to take this test again.'...(Grade 6)
>
> ...A positive response from most of the children... (Grade 6)
>
> ...Some groups just don't like it at all - they're bored with it. Some don't make any reaction to it... (Grade 3)
>
> ...Students love it - they like anything with their name on it - "Happy Birthday" - (they) never got suckers - (they) like to take tests... (Grade 1)

Responding to the final part of the question about their own avenues for communication, the sample of teachers mentioned talking to principals, the coordinator, other teachers, the girls in the office, and the reading teacher. One possibility for communication was teachers' organizations. Approximately two-thirds of the elementary teachers in grades one through six belonged to the National Education Association in 1978-79 according to a list distributed to members in August 1978. Asked if the NEA received any feedback, a teacher responded:

> ...I remember being at one meeting when there were a lot of complaints, but if there was any action taken as far as the administration, I wasn't aware of it...

Goal setting and the reports summarizing it have been discussed in an earlier section. One teacher commented on feedback from these reports and from inservice meetings:

...I don't remember people were very vocal. It doesn't seem to me people volunteered very much information at that meeting. I think people felt really unsure of what (the testing system) was going to do. Sometimes, I felt they thought it was going to be used as an evaluation and they were a little bit threatened by it. Because the principal always receives his printout of how many goals you've met and I feel sometimes people feel that's a form of evaluation for them...

Another teacher commented on district-wide meetings:

...I went to a meeting where just first grade teachers talked about their problems there, and so we felt we had a direct input over what happened...

Instructional approach.-

This component of the change program was suggested in the early pages of this report as a potential problem study area. This area was investigated in both the questionnaire and the interviews.

Members of the original planning and implementation committees had discussed this area, one member said in an interview:

...There were some who came up with the idea that (the test system) could be used - it didn't make any difference if you had a textbook or not - it could be used as the skills. Well, it can't be! I hate to say this. If teachers don't have a particular basal to call on, a lot of times they fall down on teaching reading skills. I kept insisting on that...Some place along the line, the idea was instigated - even if they hadn't been taught, go ahead and test them on (the test). Some of us kept arguing, "No, when we set the thing up one of the things we said was, 'You teach the skills and then you test'."...

Near the conclusion of each interview, the teacher was given a slip of paper to read with these instructions:

Please choose the one statement which most nearly states a basic approach to reading instruction with which you can agree.

a. A student's own language should be the base of his reading program.
b. Skill in reading will develop with a minimum of instruction if students read a great deal. "The more you read, the better you read."

c. The key to good reading instruction is a coordinated language arts approach (writing, listening, speaking, reading).
d. Reading is best taught as a sequential development of well-defined skills.
e. If a student enjoys reading, he will strive to learn all that he needs to know to succeed in reading.
f. Other - please state.

RESPONSES

Most of the interviewed teachers asked, "Can I pick two?"

c and d = 8	b and c = 1
c and e = 1	d alone = 2
c and a = 1	d and a = 1
c alone = 1	e alone = 1

One teacher explained the basis of her choice:

> ...We must have our children in a basal series or else have permission from our principal to do otherwise. Then, you're tied to a sequential development of skills, really...

The questionnaire focused on the relationship of the basal reader and the testing system in the instructional plan in question 4.

> How would you describe the integration of the (test) system into your present reading curriculum? Please circle your choice of an answer or give your own answer.

	RESPONSES	
	ORIGINAL	MIDWAY
a. Using the tests, I pre-test students, use this information as a basis of instruction, and then post-test with the tests to measure achievement.	6	3
b. I use the test system of behavioral objectives as a basis of instruction. Then, I give the tests to see if the objectives have been achieved.	5	4

(Continued on the next page)

	ORIGINAL	MIDWAY
c. I use the basal reader as my plan of instruction. Then, I use the accompanying basal magazine test to see if the objectives have been achieved. I, also, regularly give (system) tests to all of my students.	8	21
d. Other - basal then test.	15	5
basal, then teacher tests, then test.	1	1
basal		1
blank	1	1
different approaches (combinations of c and b; c and a)	(2)	(2)

Response c represented one option which I knew some teachers were using. However, the large number of Midway teachers who made that choice indicated that further checking was needed. On the interviews, I asked:

Do you use the basal magazine tests?

The sampling of teachers indicated that most of them did not. Two teachers definitely indicated that they did. However, one teacher gave a clue to the possible confusion by referring to the "questions that go along with the reader" meaning the teacher's manual. This teacher was "not aware of magazine tests".

This question, also, brought out the fact that a few teachers had recently changed to another basal series. Since the district now had a reading committee which was meeting to draw up objectives for the next year and to evaluate reading programs, this different basal might have been a pilot program.

The interview also asked:

Since you started using the testing system and the computer assistance in record keeping, do you feel that you have developed a new approach to reading instruction?

Most of the teachers in the interview sample felt that their basic approach had not changed. The addition of the testing system required the inclusion of other skills or increased the teacher's awareness of skills. One teacher described a change:

...My approach has changed. It used to be everybody had the same reading book, get a few tests. It

didn't make any difference about the capabilities of each student. Those students read the same book. I'm talking about before (the testing system). We never did shift groups before (that). We had the same old book the whole year...Now we all change in the reading program -- according to what book I'm teaching -- I have kids from third, fourth, fifth, and sixth grades in my class.

Complexity of the reading program.-

Teachers in the interview sample were asked:

How did the changes in the reading program compare in their complexity, from the teacher's role, to other curricular changes?
How did it compare to other changes to reading programs?

Teachers in answering this question based their conceptions of complexity on characteristics which made the reading change more or less complex for them than other curricula changes:

READING MORE COMPLEX	READING LESS COMPLEX
"different techniques"	"skills are skills"
"computerized"	"Materials are not changing as in live animals."
"more drastic change"	"trying to bring them to a higher level of thinking" -- in science
"didn't know what was expected"	computer helpful in grading and time - wise
"more pressure"	hands on -- discovery approach in science
"grouping"; new multiple materials; "proving" with tests, charts, records; levels	
inconsistency in program management	
correlation of computer system with basal	
more time allotted in day	
"so many details"	
"more alien to my experience"	
"formality of computer"	

Curricular context of the program change.-

The curricular context of the reading program change was the subject of three interview questions:

What other curricular changes were taking place in your grade level during this time period?

Did this have any effect on the reading program implementation?
Conversely, did the reading program implementation affect other aspects of the curriculum?
(If YES, how?)

Teachers agreed that there had been changes in every subject area -- new texts or curriculum guides. Several commented on the correlation of reading, English, spelling, language arts in a time-saving relationship. The effects of curriculum changes "went both ways". To become familiar with new books and materials took time outside school hours, some teachers said. Many teachers stressed that they gave reading first priority. Primary teachers explained the time-priority relationship:

...I think reading is hardest for me because I really feel like that's the most important subject. I really want to do the best possible and I spend more hours of the day with reading than anything else. Especially during the beginning time, now we've cut it back because we now have an hour when everybody changes for reading. We used to do it the entire morning --that's all you did was reading so that definitely was the most important subject; so I think it was a little bit harder.

...You put the reading first, but it seems like they are stressing that we get the science in and that we get all these other things in -- we just don't have the time to do them. You just don't get everything in and, when you test in a day, it takes your reading period and that's what it amounts to...

...In my room I started out with five reading groups this year. I consolidated the lower two. Four for thirty minutes equals two hours. Some teachers have more than that. And you have the other subjects that you have to teach too and some of them kind of fall by the wayside some days because you have to work on reading. Reading and spelling and math I try to get in every day and writing has to be done well no matter what we're doing. You really have to say, 'Today is the day I'm going to do a (system) test.' You have to try harder because if you don't you have to do it over anyway. I agree I think now you have to try harder. Nobody likes to do things over and over again if they don't have to. Because it just takes up more time if you do. Time is a very important element -- it really is...

Intermediate teachers commented too on the curricular context of the program change.

> ...I think it affected the things you did in English -- things covered in both. So you give up one or the other...
>
> ...There are some things that I do and that I teach that really don't have anything to do with reading that have been beneficial to (the test). If we hadn't had our unit on Japan...I'm not sure that most of those kids would have known (a vocabulary item)...
>
> ...The change in English helped. The change in math was hard. You're getting all these sheets and you have to check every skill as you teach it -- besides (the test) -- and you're going, 'How can I do it all?' So you let (the reading testing) slide so you can get started into math and try to figure what you're doing and we thought we were going to have tests (math) that were going onto the computer, but we didn't. So, we had to make our own tests. If every subject were treated like (the reading test) treats reading, we'd never get through -- cause it takes a lot of time. But I think reading should -- cause it's so important!..

VI. GENERAL DISCUSSION

1. An investigation of the ways teachers solved problems in a five-year implementation of a reading program

1.1 The individual teacher.-

Teachers responded to the implementation of this innovation in widely varying ways. Teachers and problems seemed to interact in an open system that produced differences in the perception of problems and the solutions to these perceived problems. The feelings of teachers toward the initial presentation of the innovation was noted by teachers in several interviews. Phrases such as "a period of feeling it was a nuisance", "negative attitude - positive attitude", ..."But it has to do with your students - or maybe it's me"... were used. One teacher generalized:

> ...I think this is probably true of a lot of things, not just in schools, but in our lives. If we get a poor introduction in the beginning, then we build up a wall against it. Sometimes, we have to move along with it - we may not like it and we may not really make it work very well, but we do it...

Many teachers felt a lack of support in the early stages of the computer assistance implementation, and the subsequent alterations and additions to the procedures, which could be interpreted as a form of gradualism, increased the complexity of the innovation for them. Other teachers, however, approached the innovation with a different style. There were several "plungers" in the interview sample! One teacher explained:

> ...Sometimes I think the best way to understand something is just to go ahead and do it yourself and there's always a teacher around to help if you have questions about it. There might be a better way. For me it's always been easier if I've done it myself and then, if it didn't work right, I could see where it didn't work or ask somebody why it didn't work...

Not only the individual's introduction to the innovation but the individual's frame of reference during the implementation was important to the teacher's perceptions of the process. The teachers were operating within a curricular context that encompassed change in all of the other curriculum areas. The interaction of time and work-load between areas of the curriculum was noted by a number of teachers. The grade level, too,

seemed to affect priorities slightly; however, a general consensus was that reading had first priority in the elementary school schedule. When a sixth grade teacher was asked if the other curricular changes taking place had any effect on the reading program implementation, the teacher replied:

> ...No. I set aside my reading time and it's there always. And it's always used. I never give it up...

Within the framework of a set of computer procedures which had to be mastered and which, in turn, gave flexibility to the program, teachers could implement the innovations in a personal way. One teacher described charting techniques (the most frequently mentioned organization and management procedure):

> ...I think every teacher has their own way of doing this - keeping track of it and this and that. Well, nobody has ever said, 'Do it this way or that way.' And I think that's probably good because some people have to have a much more detailed account...I have to have a great big chart...I have to have that visually for me. Others do it off the sheet that they send out periodically -- this child needs this test. That's just jumping around to me. I can't do that... It all depends, I guess, on what works for you and apparently that works well for them and it's just very time-consuming for me...I would really hate to see that dictated as to how you were going to do this because some things work really great for some and wouldn't work at all for somebody else... '

Just talking to sixteen different teachers in a short time period, using a structured interview technique, made individual characterictics, which could have influenced a teacher's adaptation to implementation, apparent to me. Unfortunately, the overt responses -- sometimes guarded --to the interview questions were recorded as the only objective data. The study was not a static one, however, nor were their perceptions. Asked to take a long-term retrospective view of the implementation period, some teachers were aware that they had changed:

> ...Well, right now I sort of like (the testing system). Starting out I didn't like it either - thought there were too many records to keep. I like it better after I've been with it through all these years...

1.2 Teachers in a group.-

One variable, the year that the teacher started the computerized testing system, was used to group the teachers in grades one through six into two main groups. Separating the teachers into two groups provided a basis for comparison of their responses. Although the two main groups also differed in years of teaching experience and, probably, age and other characteristics, the overlap of these differences and the influence of experiences such as substituting, teaching in or out of the district, and working in other jobs and in the community might have made the variation narrower in reality.

One teacher who had taught over ten years, but who was relatively new to the district and a member of the Midway group, speculated about the training of newer teachers:

> ...I don't know if the people who are coming out of schools now or starting their teaching in very individualized programs are geared differently than we are - practically from the one-room school - or what it is, but this individualization is very difficult to deal with I think...I think it's hard to shake old habits. I think it might be very difficult for me to go into an open concept school...

The beginning-year problems of each group were compared (see Figure 4). Although the rankings were different, some of the problem areas had about the same number of teachers in either group who mentioned the problem at least once, for example: tapes, test attributes, and organization and management. 15-20% more teachers who started the computerized testing program in 1973 (the Original group) mentioned time problems and correlation of the basal reader with the test than did the Midway group (1974-77). None of the latter group referred to instructional materials as a problem, as compared to five teachers in the Original group. Computer problems were slightly higher in frequency as beginning problems for the Midway group.

The implementation committee had foreseen that correlation might be a problem. In the time between adoption of the basal and adoption of the computer assisted testing system, teachers in the Original group had experiences that most of the teachers in the Midway group, who started the basal and testing programs at the same time, did not have. And in that interval of a year or more before the appearance of the "Guidelines", alternative solutions may have been probed. This may

have accounted for some of the variation shown in the responses to question 4 which described the integration of the testing system into the present reading curriculum. The responses showed that more Original teachers were trying techniques other than first teaching the basal reader, then testing. Original teachers, also, made 75% more suggestions to improve an aspect of the reading program according to the responses to the questionnaire.

Alternative solutions to the same problem were delineated by the teachers in their responses. Since the tapes were too slow or too hard to understand, many teachers gave the tests orally to individuals or small groups. Some upper grades changed to an individualized program where students were responsible for their own testing.

These solutions, in turn, could have led to other problems in a type of chain reaction or interrelationship and probably increased the complexity of the innovation for the teachers. For example, a beginning problem for which no solution was given by a 1975 teacher was:

> ...Time-consuming -- cannot do on own because of tapes being hard to understand.

If the tapes could not be used and, if the teacher had then to administer the tests personally, valuable teacher time was consumed, management problems arose in that part of the class which did not need that test, and extra materials for both parts of the class were necessary. Each "link" took more teacher time and energy. Interrelationships such as these had to be probed until some kind of equilibrium had been achieved or else frustration mounted.

Beginning-year problems marked as unsolved were usually either "time" or some perceived attribute of the test. Twelve Original teachers designated seventeen problems as unsolved, while seven Midway teachers designated fourteen problems as unsolved.

One teacher explained the frustration of those with unsolved problems:

> ...I don't see where the problems got any less because you still have to go out and get materials for these things that are stuck in these tests that are not taught in the book - and they're above their level. I'm still in the same place I was the first year because I'm still having to scrounge to find materials to bring in for these things that are supposed to be taught at (one level) but are tested in (another). It seems like we

should be spending the time reinforcing the skills they're supposed to learn there, instead of going to learn something that's harder...

1.3 Complexity of the innovation.-

Variations and interactions contributed to the complexity of the innovation. The possible perceptions, together with the alternative processes and procedures operating within a curricular context which included many other changes in the elementary school, made this innovation much more complex than a straightforward adoption of a new text. Some teachers realized that other factors also contributed to complexity. The feeling that they could not rely on a backlog of experience ("didn't know what was expected", "more alien to my experience") probably increased their perceptions of complexity.

A few of the interviewed teachers cited the new science program as more complex because it involved "concepts", "a higher level of thinking", "hands on, the child discovers whatever it is we're looking for", "it's not written in the book -- you get in there and ask your questions..." The new science program represented for these teachers a change in their role from the didactic to the facilitative -- but only in a small percentage of the total curriculum.

In general, the teacher's role remained relatively stable throughout the implementation period of the reading improvement program. When the teachers were asked about exchanging groups (questionnaire) or about developing a new approach to reading instruction (interview) or about integrating the testing system into the present reading curriculum (questionnaire) -- any of which could have changed the teacher's role significantly -- only a small number of teachers indicated some change. The complete role change which Gross, Giacquinta, and Bernstein (1971) described in their study of public school innovation would have added another dimension to the complexity of this reading program.

The question about instructional approaches to reading (interview) was intended to give clues to some other aspects of the teacher's role. It was hypothesized that if teachers were in agreement with the use of a basal and a skill testing system, they would probably prefer the choice about teaching reading as a sequential development of well-defined skills. Over 80% of the interview sample did prefer this choice, but in combination with other choices. Half of the sample chose sequential development of skills in combination with a

language arts approach. This represented a concurrence by most of the sample with the program's basic approach to reading instruction using a basal series and skill testing.

The stabilizing effect of a "sequential development of well-defined skills" was threatened, however, by the lack of correlation between the basal and the testing system which many of the Original group had perceived. This was restored for many teachers by the "Guidelines".

Other techniques of structure provided a stability for the program. Rogers and Agarwala-Rogers (1976, p. 6) discuss the concept of stability:

> An organization is a stable system of individuals who work together to achieve, through a hierarchy of ranks and division of labor, common goals. The relationships among the members of an organization are relatively stable; this structural stability enables an organization to function effectively in accomplishing certain objectives. Organizational structure lends predictability and stability to human communication, and thus facilitates the accomplishment of administrative tasks.

Since the organizational and role changes were small, teachers could use scheduling and charting to solve some of their time problems. The computer component was designed to combat time problems and together with the structures of sequential skill development, scheduling, and charting, forced a procedural structure upon the innovation. These stabilizing influences helped reduce complexity by reducing unanticipated component interactions as teachers tried to adapt to changes and to achieve an equilibrium between the multiple components of this complex innovation.

2. A study of the change process over time as a factor in the teachers' problem solving

2.1 Getting it all together.-

The most dramatic illustration of the time factor in this implementation appeared in the statements of two outstanding teachers who said it had taken them four years before they felt as if they'd "gotten it all together as far as using the testing system and the computer."

Other teachers indicated "the start of my third year", a computer change made in March 1978 (a teacher in the Original group), "about two years", "when we were forced to make goals (1976)", (a 1974 teacher).

One of the "four-year" teachers perceived:

> ...It seems like the attitude of approaching the subject has changed in that it seemed in the beginning it was almost a dictatorial approach in that 'This is it -- you do it -- tough.' Whereas, then, I think they began to feel, 'We want this used. We have spent a lot of money on it. We feel it's important and we want you to feel the same way' -type approach. So that people were being educated -- their minds changed in a sense -- by using a more considerate approach in that they felt they were being involved and not just told what to do. And their opinions were being considered...

Overcoming initial resistance in some organization members was facilitated by their long-term relationship with the faculty Alderfer and Brown (1975) noted in their study. Many of the same effects can be recognized in teacher's remarks about this reading improvement implementation. Although the introduction of the multiple components of a new basal, a criterion skill test, and a computer required many changes which had not been instigated by the teachers themselves, the long implementation period made adjustments possible. One teacher vividly explained the initial shock:

> ...Then we came in with this (test system) -- just blew your brains out. When they first gave it to us, it was just given to us in a big lump. As the year went by, they realized that nobody knew what they were doing. So, they started giving some more help. And I think that really helped everybody, so by the time maybe some of the others were coming in, we had a little more help...

"Help" for some teachers was a person: the coordinator, a reading teacher, a principal, another teacher who stepped in at an appropriate time to lend a hand. "Help" for other teachers was the computer or a computer program change which cleared up a problem that had emerged over a period of time, such as children missing a skill the second time around that they had passed on the first testing. "Help" for other teachers was an event: the correlation of skills in the "Guidelines" and/or goal setting, for example.

2.2 Gradualism.-

These events had been a part of the original plan and probably represented the "gradualist strategy" (Smith 1971) to some extent. This "gradualism" resulted

from several factors. Time ran out. The correlation was discussed by the original implementation committee, but several members said that they did not have the time to accomplish it. Money could have run out. Budgeting money for the acquisition of new support personnel, development of materials during the summer, as well as the development of test scripts probably made "gradualism" a necessity.

At other organizational levels, also, "gradualism" was apparent. Some teachers were still using the magazine tests that had accompanied the basals -- in addition to the new testing system -- even though other teachers said magazine tests were "not available for our use". Still other teachers bridged the new and the old by using another test in the teachers' manual or by constructing their own tests -- in addition to the new testing system.

To some extent teachers could control the increments of movement (Bowers 1976) personally. Several teachers, in their interviews, remarked that they had delayed starting their testing in the fall either because of a new basal reader or a new grade level. Then, however, they were reminded to begin:

> ...I was rather worried about it at the beginning of the year and several of them said, 'Oh, don't worry about it.' Then, all of a sudden they said, 'Well, have you given any tests?'...

Teachers had some control over the achievement results by means of the goal setting procedure they used. There is some evidence that, in the two years in which they had been implementing goal setting, they had demonstrated a personal effort to "aim low, score high." (Smith 1971)

Another perspective of "gradualism" seemed apparent. Was it possible that certain problems such as time or materials could actually have increased over a lengthy implementation period? Some teachers who were interviewed saw this possibility for several reasons:

a. Awareness - "a matter of education". As teachers became better acquainted with tests and/or materials, they saw a problem in correlation or interest that they had not seen before.
b. Variety - Different ways of presenting the same thing were necessary if a child needed continued skill reinforcement and testing.
c. Backlog - Upper grade teachers could have been hit by an accumulation of tests needed due to absences, lack of testing, or new students.
d. Adding on - never deleting anything from the curriculum. New programs were adopted in every subject area over a period of time.

These elements, accumulating over time, would have resulted in the perception of new problems and effects.

The slow process of organizational change producing effects which appear after several years have elapsed (Seashore and Bowers 1970) was studied in this innovation then, at different organizational levels over a long implementation period. Moreover, the small steps of change accumulated into an adaptation or solution -- or an increasingly larger problem area. Mutual adaptations, such as keeping the old tests (or substituting others) as well as adopting new tests, may have caused new problems in time and materials to appear.

2.3 Teachers' suggestions.-

When the teachers were asked in the interviews for suggestions that would have improved any phase of this change, they suggested the following:

a. Phase it in by grade levels -- "start it in first or second grade one year; the next year make it go through fourth..."
b. Probe for new solutions using the computer: "Why can't computer do this?"
c. .."Educate your teaching staff to the proper use of the materials and be open to their needs and suggestions..."
d. Provide for more continuity between grades -- pass chart information along.
e. Communicate -- ..."That's all we need is just communication between each other to do this..."
f. Correlate at the beginning.

As the teachers looked ahead to improved techniques and a new reading committee in the process of planning new program changes, it was apparent that they felt competent to adapt.

3. An analysis of the teachers' group interactions as part of a socio-technical system in a school organization

3.1 Communication in the school district.-

The need for effective communication, formally and informally, at all levels of this school organization was met in the early stages of the implementation by committees, documents, and questionnaires. Early committees bridged organizational levels and school buildings in a pragmatic approach to the innovation. Administrators and teachers from different schools worked together on a 1972 implementation committee, a key administrator said, adding, "Unless you really got in and worked on

the thing, you didn't get the overall view of it." Teachers, when they were interviewed, also referred to the information they received in committee work. One teacher, who had volunteered for the current reading committee, said:

> ...I feel like maybe I'll be better prepared for the next one if I get in right on the ground floor...

Questionnaires to teachers, students, and parents provided information to the Board of Education about the district's needs in reading. An October 1973 questionnaire determined teachers' problems soon after they started using the computerized testing system.

Following these questionnaires and committees, inservice meetings held each year, usually in the fall before school started, were the main channel for district-wide communication at all levels. Outside consultants from universities and publishers were involved, too, in these meetings and in the extension reading course held in 1972-73.

Otherwise, there seemed to be little interaction and communication throughout the district which included the administrators and teachers from different buildings. The local National Education Association and the local chapter of the International Reading Association included a few administrators in their memberships. Usually, once a year, the superintendent attended an NEA meeting to listen to teachers' concerns. At one meeting, the testing program was among the items discussed. There was some evidence, too, of discussion about the reading program in Parent-Teacher Association meetings.

Principals and central office administrators met in regularly scheduled meetings during this implementation period. The method of implementation in this district was to use administrators, a central office administrator said in a recent inservice meeting. The strength of the district, he continued, was that the staff could make their wishes known to the principal, the Board office, or the Board of Education.

3.2 Within the schools.-

Formal meetings about the reading program were most often held within individual elementary schools. I recall a faculty inservice meeting on Friday, March 7, 1975 which started at 7:40 AM at which I, as a Title I reading teacher assigned to that building, led a faculty discussion of "ideas" for using the testing system. I had asked several of the teachers to make presentations.

For example, one teacher had an especially good organization system using index cards which she told about.

The Title I reading teacher, during some of the early implementation years, was a resource person in the use of the testing system. When a classroom teacher requested it, the reading teacher would work in the classroom, provide additional materials, or help with individual testing. Transfers to different schools, travel between two assigned schools, and monthly meetings provided another avenue of communication between schools.

The coordinator of the reading improvement program, who started the job in the spring of 1974 after working in the district as a Title I reading teacher, was a key avenue of communication between all organizational levels in the district. Working with teachers, individually and in groups, principals, reading teachers, and central office personnel, the coordinator helped to solve problems by working with summer committees which produced materials and resource guides as well as the "Guidelines". The coordinator gave inservice presentations about setting goals and some training sessions for new teachers.

3.3 Between teachers.-

If a teacher needed help, it was difficult to contact anyone any further away than the classroom next door, a teacher explained:

> ...They'll come in and they'll say, 'You know I'm having this trouble. What can I do about this or what should I do?' Because the principal's not always available, when you need them right at that time, maybe they're not available to answer your question. And you can't always leave your class to go running down...

Teachers indicated in the interviews and on the questionnaire that they received information and help from the other teachers as they tried to adapt to this innovation. Thirty percent more Midway teachers than Original teachers said that other teachers gave them information about the system. Furthermore, approximately two-thirds of each group of teachers marked on the questionnaire that they learned techniques from other teachers.

Many teachers, then, wanted and used the collegial support of their fellow teachers in learning techniques and airing complaints. A much smaller number actually indicated that they traded or exchanged groups for testing or skills instruction. The apparent discordance

of teachers working largely alone yet seeking peer assistance has been noted in other studies (Lortie 1975, page 76).

This collegial support noted by two-thirds of the teachers acquainted them with the problems and solutions of other teachers and perhaps standardized some procedures. As one teacher said in an interview:

> ...I think everybody that's using it is dealing with it in the same way because we talk among ourselves here in the hall and how we use it and what we work with it and what problems we have with it and the time we use with it and I think we all basically deal with it about the same... because there isn't really that much leeway to what you do with it...

But there was some leeway in the organization and management techniques which teachers used. On the questionnaire two-thirds of the teachers mentioned a chart as the organization and management procedure which they developed in their own classroom in order to use the test system and the computer. Another teacher expressed the idea in an interview that there was great variety in charting:

> ...Every teacher has their own way of doing this. If somebody is going to help a new teacher, they might want to be aware of several ways that would be possible to use and kind of give them a choice. And maybe that teacher would work out her own thing after she gets the hang of it...

New teachers in 1978 relied on other teachers and most of them suggested on the questionnaire that some inservice training be held. Usually, however, training for new teachers had been held at the end of their first semester in the program. When the teachers who were interviewed were asked about training new teachers, most of them indicated that they felt new teachers should meet initially before school started in the fall. A support group of this type might have reduced some of the anxiety felt by new teachers and might have helped them to get started in the testing program.

3.4 Use of a computer.-

One of the causative factors of the interraction between teachers in the school organization was the computer. The new procedures and materials, the new partnership in grading and grouping were something for teachers to discuss.

Teachers seemed to have ambivalent feelings about computerization: frustration about some procedures, mistakes, possible evaluation, and expense along with more positive feelings about the help in grading the computer gave. Opinions varied widely, though, as to whether the computer assistance was a necessary adjunct to the testing system.

Computer printouts, however, were a quick and widely disseminated communication device which went to all organizational levels and to the community. Parents and students received test results which became the subject of many parent conferences, teachers said. The efforts of teachers and students which were shown on summary printouts were highly visible to many more people than ever before: other teachers, principals, other administrators, Board of Education members. This wide visibility into the classroom was slightly threatening according to some teachers. It may also have been one reason for the 100% utilization of the computer assistance after five years of implementation.

The sophistication of a communication device such as a computer printout, however, seemed to produce a backlash of parent confusion that teachers had not been able to straighten out with conferences and extra explanations. The complexity of the skills structure, the vocabulary, and the coding of the test system may have been too esoteric to have been a useful communication device which parents could use independently. Guided in their interpretations at parent conferences, parents could be educated about this latest innovation over a long period of time.

> ...I'm not really scared of the computer and I'm sure it can be a lot more helpful than it is...

a teacher commented. Humor and personification seemed to bridge the lack of humanness which some teachers felt in dealing with a machine and a data processing staff which they never saw.

The presence of the computer in the system of organization had affected some of the teachers' procedures. However, some teachers still felt that they had to grade papers and to keep charts to stay in touch personally with the progress of their students.

Whatever their feelings were about the computer, teachers had learned a great deal about new technological possibilities for schools. Some teachers looked to the future:

> ...Some day we'll be sitting there with our terminals in our rooms, keying it in. Think about it!...

4. Conclusion

Within the context of our fast-moving, technological society, educational change and innovation have several functions: (1) to hypothesize a solution in a school problem solving process; (2) to meet educational goals more efficiently; (3) to stimulate interest and progressive development in school personnel. This long-term retrospective study of a five-year implementation of a reading improvement program concluded that this innovation functioned in all three of these areas.

Because the reading achievement of the elementary students in the school district seemed to have diminished, the school district adopted a new basal reader program and a new testing system. These two components, coupled with computer assistance, were the basis of an innovative program which aimed to efficiently increase reading achievement in the district.

Teachers met the challenge and adapted in different ways. However, the overall complexity of the innovation was generally relieved by structuring skills (correlation guidelines), time (schedules), and routines (classroom and computer procedures). Also, teachers found support in exchanging ideas and complaints with other teachers.

The duration of time was an important factor in this study. Teachers were asked to look back over the implementation period and to report on their perceptions of the program. Some teachers in the interview sample reported that it took them two--three--even four years for things to fall into place.

One reason for this may have been that several important components of the original plan were delayed in their implementation due to a lack of resources of time, money, or personnel. "Gradualism", while desirable perhaps, was sometimes a necessity.

Teachers, in trying to adapt, developed some new organizational arrangements and approaches. However, many teachers continued to carry over the old techniques and to add on new components, to use basal tests as well as the testing system, or to grade tests and to chart in addition to the data processing efforts. About one-third of the teachers felt as if they were currently teaching two separate reading systems.

Many teachers felt that they had developed a new awareness of the components of reading instruction. Their interviews showed that they had developed many insights into implementation and change in schools.

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APPENDIX 1

---------- ELEMENTARY TEACHER'S BULLETIN #1 ----------

TO: All Elementary Teachers

FROM: Director of Research and Planning

DATE: October 18, 1973

SUBJECT: Computer Managed Reading Program

In order to assess our progress in the Reading Program and to determine the effectiveness of our service to you, I would like for each teacher to complete the following questionnaire and return it to me by October 25, 1973. Please feel free to make any comments which you feel are pertinent and might assist me in improving our service to you or improving the Reading Program in general.

Your patience and help have been greatly appreciated during the development of the program. Thank you for your assistance in this questionnaire.

10-12-73

Reading Program Progress Questionnaire

Class No.

1. Have you administered any tests? 56 yes 8 no

   Comments _____

2. If yes, approximately how many. _____

3. Were the results returned complete? 52 yes 2 no. 10 = no answer

   Comments 1 yes said "I think so"

4. Do you prefer the carbon left in the results? 10 yes 38 no. 16 = no answer

   Comments Some didn't answer but gave comment.

5. Have the grouping suggestions been useful? 36 yes 6 no. 19 = no answer

   Comments 2 answered both yes & no - 1 = had "?" on yes.

6. If no, reason for uselessness.

7. Is the frequency of class groupings appropriate (i.e. weekly) 27 yes

   10 no. Comments 1 = answered both; 26 = no answer or not sure

8. If no, what frequency would you suggest?

9. Is the frequency of other groupings (i.e. grade, school) appropriate?

   17+1 "?" yes 9 no. Comments 35 = no answer

   or not sure & 2 had "?" on both yes & no

10. If no, suggest others _____

11. Would it be worthwhile to plan a faculty meeting in your building to discuss the program? 23 yes 28+1 "?" no 11 = no answer or not sure

12. State below any major questions you might have regarding the Reading Program.

"Utilization Questionnaire"

Problem Areas Described

64 Elementary teachers from a possible 92 responded = 69.5% of the total staff responded. Of the 64 responding, the following concerns appeared most frequently:

1. Lack of enough time to reteach. Time problems in general.	14 responded which =	21.5% of respondents
2. Retesting - If correct on first test and miss on second. Reprinting of deficiencies each time?	8 responded which =	12.3% of respondents
3. Where to begin - what level to enter child. Lack of understanding of program.	4 responded which =	6.2% of respondents
4. Need help in finding materials.	3 responded which =	4.4% of respondents
5. Equipment and supply problems.	1 responded which =	1.4% of respondents
6. Miscellaneous. Examples: Program Deficiencies, Grades, Positive Comments	9 responded which =	14.4% of respondents
7. No Comment	25 returned - no comment	39.8% of respondents
	Total 64	100%

(*Questionnaire and results used with the permission of the former Director of Research and Planning.)

Nov. 8, 1973

APPENDIX 2

PROJECT QUESTIONNAIRE

October 1978

TEACHERS ADAPT TO INNOVATION

This research project is part of a program of research on organizational processes in education encouraged by the National Institute of Education. The project goal is to study the ways teachers solved problems in a five-year implementation of a reading curriculum.

Please answer the following questions as completely as possible. Use the back of the paper if necessary. Please remain anonymous.

1. What grade are you teaching this year?_____

2. How many years have you taught school (including this year)?_____

3. Our computer managed Reading System was introduced to most district teachers in the fall of 1973. When did you start using the Reading System?_____Month____Year

4. How would you describe the integration of the System into your present reading curriculum? Please circle your choice of an answer or give your own.

   a. Using the tests (System), I pre-test students, use this information as a basis of instruction, and then post-test with (System) tests to measure achievement.

   b. I use the System of behavioral objectives as a basis of instruction. Then, I give (System) tests to see if the objectives have been achieved.

   c. I use the Basal Reader as my plan of instruction. Then, I use the accompanying Basal magazine test to see if the objectives have been achieved. I, also, regularly give System tests to all of my students.

   d. Other_____
   _____

5. Currently, do you have any problems in using the System and/or the computer technology?

   YES NO

   Please circle your answer. If 'YES' please turn this page over and answer question number 6.

6. Currently, I have the following problems in using the System and/or the computer technology:

(Please circle all the letters of your choices. Star the one most important to you.)

a. It requires too much time to keep the necessary records.

b. I need more skill instruction materials.

c. I feel as if I am teaching two separate reading systems.

d. I have retesting problems, such as _____

_____

e. I lack enough time to reteach skills.

f. I have trouble determining the level at which to enter a child into the system.

g. Others _____

_____

7. What roles have other teachers played this year and/or in previous years as you tried to adapt to this innovation?

(Please circle all the letters of your choices. Star the one most important to you.)

A. Other teachers gave me information about the system.

B. I learned techniques from other teachers which made things run more smoothly.

C. We aired our complaints to each other.

D. We traded groups for testing.

E. We exchanged groups for (System) skills instruction.

F. Others _____

8. Can you list at least three problems which you encountered in the <u>first</u> year you used the System and the computer technology. If there was a solution, what was it?

Please use the letter of any of the problems listed in question number 6 or use your own words. Please list the problems in order of importance to you -- A highest.

A. Problem: _____

Solution: _____

B. Problem: _____

Solution: _____

C. Problem: _____

Solution: _____

(If you need more room for additional problems and solutions, please use the back of the paper.)

9. What organization and management procedures did you develop in your own classroom in order to use the System and the computer?

_____

_____

*(Throughout the questionnaire, the testing system is referred to as the "System". In the original questionnaire, which the teachers received, the complete title of the testing system is used.)

10. Did you make any suggestions to improve any aspect of the reading program?

YES NO

If you circled YES, please explain your suggestion and include the time and place it was made.

_____

_____

THANK YOU for participating in this research project.
Please return this questionnaire to:

Dorothy Schulz
Career Opportunity Center

APPENDIX 3

PROJECT INTERVIEW

March 1979

TEACHERS ADAPT TO INNOVATION

1. What grade are you teaching this year?
2. Have you changed grade levels in the past six years?
3. Did you change schools?
4. How long have you been a teacher in the district?
5. How long have you been a teacher?
   Where?
   What grades?
6. What reading courses have you taken?
7. To what extent did these courses prepare you to use the System?
8. What experience did you have with computers?
9. Were you a participant in the planning phase of the present reading program? (If yes, please describe.)
10. How did you first learn the procedures for System testing and for using the computer assistance?

    What kind of training should new teachers have -- can other teachers help?
11. When did you begin using the System?
12. Since you started using the System and the computer assistance in record keeping, do you feel that you have developed a new approach to reading instruction? (If 'yes', please explain.)
13. Was the computer assistance a necessary adjunct to the testing program?
14. Can you make some statements about your experiences with a computer? What's in the future for computers and schools?
15. Looking back over the implementation period, was there a definite point in time when things fell into place for you and you felt as if you'd gotten it all together as far as using the System and the computer?
16. Do you feel that you are teaching two separate reading systems at the present time?
    (If 'yes', please explain.)

Does the term 'coordination' seem to fit this situation?

This 'coordination' seems to have been more of a problem for teachers who were in on the beginning of the System then and now. Can you explain this?

17. Do you use the Basal magazine tests?

18. Do you have some kind of organization chart for the System? Why is this so useful?

19. Do you think the test System and the computer assistance programs have developed the way they were originally intended to?

20. None of the teachers who started the test System* in 1974-77 named materials for skills instruction as a problem when they first started. However, some now say they need more skill instruction materials. Can you explain this? Do you have this problem?

21. I'm referring to the questionnaire that was distributed to all of the elementary teachers in November -- time problems seemed to increase for everybody. Is this true? Can you explain this?

22. What other curricular changes were taking place in your grade level during this time period?

23. Did this have any effect on the reading program implementation? (If 'yes', explain.)

24. Conversely, did the reading program implementation affect other aspects of the curriculum? (If 'yes', how?)

25. How did the changes in the reading program compare in their complexity, from the teacher's role, to other curricular changes?

How did it compare to other changes to reading programs?

26. What suggestions can you make to have improved any phase of this change?

27. Did feedback procedures take place? Parents? Students? What avenues were available to you for communication about the program?

28. Choose approach to reading instruction from choice sheet.

*Throughout this copy of the interview, the testing system is referred to as the "System". In the original interview, which the teachers answered, the name of the testing system was used.)

28. Please choose the one statement which most nearly states a basic approach to reading instruction with which you can agree.

a. A student's own language should be the base of his reading program.
b. Skill in reading will develop with a minimum of instruction if students read a great deal. "The more you read, the better you read."
c. The key to good reading instruction is a coordinated language arts approach (writing, listening, speaking, reading).
d. Reading is best taught as a sequential development of well-defined skills.
e. If a student enjoys reading, he will strive to learn all that he needs to know to succeed in reading.
f. Other -- please state._____
_____

29. Summary of implementation over time.